9. $a = 1 + 3\sqrt{t}\ \frac{\text{mph}}{\text{sec}}$ for 9 sec

b) How far $\int_0^9 v\,dt$ = displacement

we need v

also distance if $v > 0$ on $[a, b]$

$v = \int 1 + 3t^{1/2}\,dt = t + 3\frac{t^{3/2}}{3/2} + c$

$t = 0$

$v = 0$

$c = 0$

distance $= \int_0^9 t + 2t^{3/2}\,dt = 234.9$ mph·sec

$234.9\ \frac{\text{mi}}{\cancel{\text{hr}}} \cdot \cancel{\text{sec}}\ \frac{\cancel{\text{hr}}}{3600\ \cancel{\text{sec}}} = .06525\ \text{mi}$

$.06525\ \frac{\cancel{\text{mi}}\ \ 5280\ \text{ft}}{\cancel{\text{mi}}}$

344.5 ft

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37 $\frac{1}{2}\left(.04 + 2(.04) + 2(.05) \ldots + .05\right) = .585$

$\frac{1}{12-0}\int_0^{12} \text{rate}\ dt$

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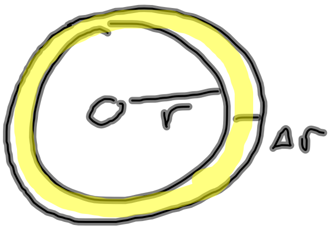
23.

density $= 10{,}000\,(2-r)\ \dfrac{\text{people}}{\text{mi}^2}$



area of ring

$\Delta A \approx 2\pi r\,\Delta r$

people in strip $\rightarrow \Delta P \approx \underbrace{10{,}000\,(2-r)}_{\text{density}}\ \underbrace{2\pi r\,\Delta r}_{\text{area}}$

$$\text{Total Pop} \cancel{\approx} = \lim_{\Delta r\to 0}\sum_{i=1}^{n} 10{,}000\,(2-r_i)\,2\pi r_i\,\Delta r$$

$$83{,}776 = \int_0^2 10{,}000\,(2-r)\,2\pi r\,dr$$

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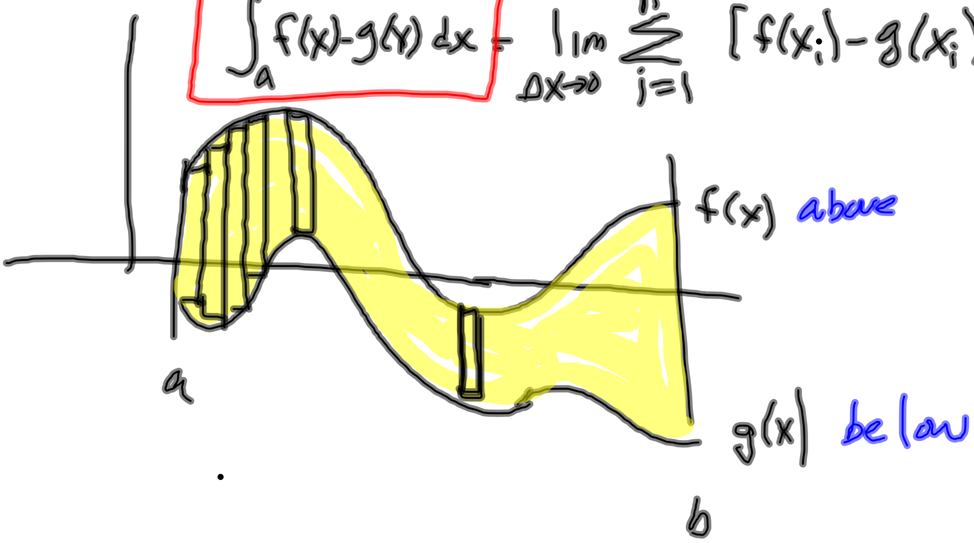
7.2 area between 2 curves

height · width

$$\boxed{\int_a^b f(x)-g(x)\,dx} = \lim_{\Delta x\to 0}\sum_{i=1}^{n}\left[f(x_i)-g(x_i)\right]\Delta x$$



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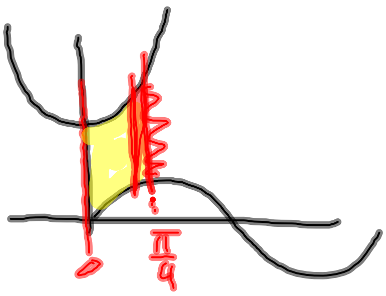
Find the area between $y=\sec^2 x$ & $y=\sin x$ on $[0, \frac{\pi}{4}]$



$$\int_0^{\frac{\pi}{4}} \sec^2 x - \sin x \, dx$$

$$\tan x + \cos x \Big|_0^{\pi/4}$$

$$\tan\frac{\pi}{4} + \cos\frac{\pi}{4} - (\tan 0 + \cos 0)$$

$$1 + \frac{\sqrt{2}}{2} - 1 = \frac{\sqrt{2}}{2}$$

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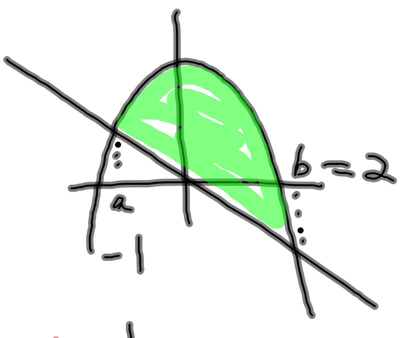
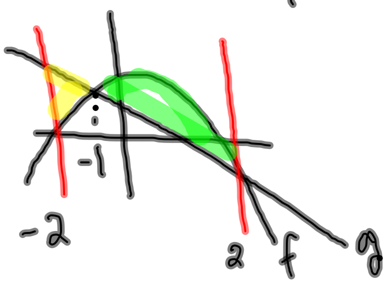
Find the area bound by $y=2-x^2$ & $y=-x$



$$2-x^2 = -x$$

$$0 = x^2 - x - 2 = (x-2)(x+1)$$

$$\int_{-1}^{2} 2-x^2 - -x \, dx = \frac{9}{2}$$



$$\int_{-2}^{-1} g - f \, dx + \int_{-1}^{2} f - g \, dx$$

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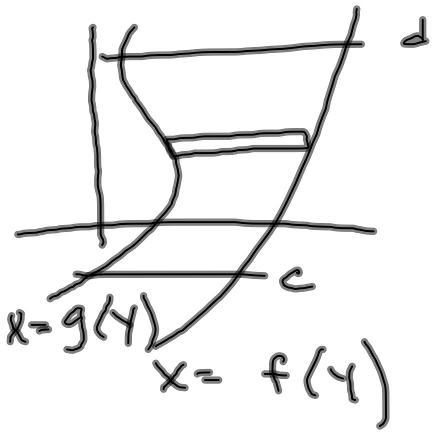

area = $\int_c^d \overset{\text{right}}{f(y)} - \overset{\text{left}}{g(y)} \; dy$

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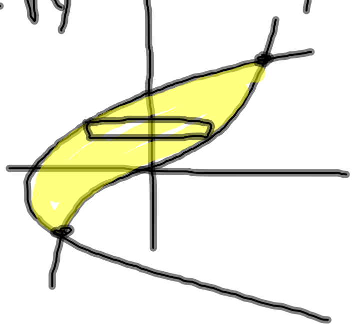
Ex 6 $\quad y = x^3 \qquad x = y^2 - 2$

$x = \sqrt[3]{y} \longrightarrow x = y^{1/3}$



$$\int_{-1}^{1.7930} y^{1/3} - (y^2 - 2) \; dy$$

$\underline{y^{\frac{1}{3}} = y^2 - 2}$ use to find c, d

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